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THE PLANT DISEASE REPORTER

Issued by

THE PLANT DISEASE SURVEY, DIVISION OF MYCOLOGY AND DISEASE SURVEY
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The Plant Disease Reporter is issued as a service to plant pathologists throughout the United States. It contains reports, summaries, observations, and comments submitted voluntarily by qualified observers. These reports often are in the form of suggestions, queries, and opinions, frequently purely tentative, offered for consideration or discussion rather than as matters of established fact. In accepting and publishing this material the Division of Mycology and Disease Survey serves merely as an informational clearing house. It does not assume responsibility for the subject matter.

IN THIS ISSUE

Check list revision, by Freeman Weiss, page 416

Donald G. Fletcher reports observations on small grain diseases made during a survey from Northern Mexico to Nebraska and Iowa, page 422.

Other reports on rusts and other diseases of small grains in the Plains region are by Ian W. Pervet from Minnesota and South Dakota, page 424, by C. O. Johnston from Kansas and Oklahoma, page 425, by C. M. Slagg, from Kansas, page 427, and by I. M. Atkins, from Texas, page 428.

Bean disease symptoms of undetermined origin, occurring in Idaho and Washington, are described by Earle C. Blodgett and Herman K. Schultz, page 429

Otto A. Reinking, page 432, reports results of a brief study of Cinchona diseases in Guatemala.

In Brief notes, page 439, C. M. Slagg reports on alfalfa diseases in Kansas, William W. Diehl reports a new host record for mallow rust, and W. D. Valleau reports tobacco downy mildew in Kentucky.

April weather, page 441

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CURRENT SERIAL RECORD
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U. S. DEPARTMENT OF AGRICULTURE

CHECK LIST REVISION

Freeman Weiss

POA (GRAMINEAE)

POA ALPINA L., ALPINE BLUEGRASS (1); also P. GLAUCA Vahl (2) and P. STENANTHA Trin. (3). Low perennials of northern latitudes and mountain summits, of sparse distribution and minor forage value.

Claviceps purpurea (Fr.) Tul., ergot. Wash. (3)
Mycosphaerella sp. (Sphaerella graminum Sacc. & Scalia), on leaves. Alaska (3).
? Phyllachora graminis (Pers. ex Fr.) Fckl., tar spot. Wis. (2)
Puccinia graminis Pers. var. poae Eriks. & Henn., II, III. Natural infection of (1) reported in PDR Suppl. 130
P. poae-sudeticae (West.) Jørst. (II, III), leaf rust. Colo., Mont., Wyo. (1); Wash. (3). O and I unknown.
Scolecotrichum graminis Fckl., brown stripe. Mich. (3).
Selenophoma donacis (Pass.) Sprague & A. G. Johns. var., speckle. Mont. (1)

POA ANNUA L., ANNUAL BLUEGRASS (1). Tuft-forming annual of Europe, established in lawns, pastures, and waste ground throughout the U. S., including the far South; serves as a winter lawn grass in the South and furnishes food for wildlife but is generally considered a weed. P. BIGELOVII Vasey & Scribn. (2), P. BOLANDERI Vasey (3), and P. CHAPMANIANA Scribn. (4) are native annuals occurring respectively in the southern Great Plains, the Pacific Northwest, and the Southern States.

Claviceps purpurea (Fr.) Tul., ergot. Okla. (1)
Entyloma irregulare Johans., pale leaf smut. Oreg. (1)
Fusarium culmorum (W. G. Sm.) Sacc., head mold. Oreg. (1)
F. scirpi C. R. Lambert & Fautr. var. acuminatum (Ell. & Ev.) Wr., secondary root rot. N. Dak. (1)
Gibberella zeae (Schw.) Petch, culm rot. Wis. (1)
Puccinia graminis Pers. (II, III), stem rust. Wis. (1). Also reported on (4) in PDR Suppl. 130
P. poae-sudeticae (West.) Jørst. (II, III), leaf rust. Calif., Del., N. Y., Oreg. (1); N. Mex. (2); Oreg. (3)
Rhizoctonia solani Kuehn, brown patch. Occasional (1)
Sclerotium sp. (? Sclerotinia homoeocarpa F. T. Bennett), leaf rot, ? dollar patch. Mass. (1)
Septoria macropoda Pass., leaf blotch. Oreg., Wash., Wis. (1)

? Sorosphaera radicalis W. R. I. Cook, in roots. Calif.
Ustilago striaeformis (West.) Niessl, stripe smut. Mass. (1); Ky. (4). The form on this host has been designated poae-annuae W. H. Davis

POA COMPRESSA L., CANNADA BLUEGRASS (1). Turf-forming perennial of Europe, widely established in the U. S., especially the Northeastern and Central States and the Pacific Northwest; used in lawns and pastures and preferred to other bluegrasses on dry and poor soils. P. ARACHNIFERA Torr., TEXAS B. (2), occurs on prairies and plains in the southern Great Plains region and is used in lawns and winter pastures. P. NERVOSA (Hook.) Vasey, WHEELER B. (3), occurring in mountain meadows and open woods in the Pacific Northwest and Rocky Mountain States, is a valuable range grass.

Cladosporium herbarum Pers. ex Lk., leaf and glume mold. N. Dak., Oreg., Wash. (1). Also reported as Mycosphaerella tulasnei Jacz.

Claviceps purpurea (Fr.) Tul., ergot. Minn., Mont., Okla., Wis. (1)

Curvularia geniculata (Tracy & Earle) Boed., on leaves and glumes. N. Dak. (1)

Dinemasporium graminum Lév., on fading leaves. Md.

Entyloma crastophilum Sacc., dark leaf smut. Oreg. (1)

Epichloë typhina (Pers. ex Fr.) Tul., cat-tail. N. Dak. (1)

Erysiphe graminis DC., powdery mildew. Minn., Mont., W. Va. (1)

Fusarium equiseti (Cda.) Sacc. and F. scirpi C. R. Lambert & Fautr. var. acuminatum (Ell. & Ev.) Wr., secondary root rot. Minn. (1)

F. heterosporum Nees, head mold. Ill. (1)

Helminthosporium giganteum Heald & Wolf, zonate eye spot. Md., Va. (1)

H. vagans Drechs., leaf spot. N. Dak., Oreg., Wash. (1)

Hendersonia calospora Fautr. (? H. crastophila Sacc.), on leaf sheaths and stems. N. Dak. (1)

Leptosphaeria sp., on dead culms. Colo. (3)

Lophodermium arundinaceum (Schrad. ex Fr.) Chev. var. culmigenum (Fr.) Fekl., on culms. N. J.

Ophiobolus graminis Sacc., take-all. N. Y. (1)

Puccinia coronata Cda. (II, III), crown rust. Kans., Mo., Pa. (1); Ala. (2). O and I on Rhamnus spp.

P. graminis Pers. (II, III), stem rust. Ind., Mich., Pa., Va., Wis. Only the var. poae Eriks. & Henn. has been identified in natural infections.

P. poae-sudeticae (West.) Jørst. (II, III), yellow leaf rust. Colo., Md., Mich., Minn., N. Dak., Oreg., Pa., Wash. (1); Ala., Tenn. (2); Wash., Wyo. (3).

P. rubigo-vera (DC.) Wint. (II, III), orange leaf rust. Mont., Utah (3). Var. agropyri (Eriks.) Arth. with O and I on Ranunculaceae identified.

Rhizoctonia solani Kuehn, brown patch. Cosmopolitan but infrequent (1).

Scolecotrichum graminis Fckl., brown stripe. General (1)

Selenophoma donacis (Pass.) Sprague & A. G. Johns., speckle. N. Dak. (1)

Septoria macropoda Pass. var. septulata (Gonz.Frag.) Sprague, purple leaf blotch. Oreg. (1), Wash. (3)

S. oudemansii Sacc., tan leaf spot. N. Dak., Oreg. (1)

Stagonospora intermixta (Cke.) Sacc., leaf spot. Miss. (2)

Ustilago striaeformis (West.) Niessl, stripe smut. Ind., Pa., W. Va. (1)

POA FENDLERIANA (Steud.) Vasey, MUTTONGRASS (1). Perennial bunchgrass occurring from medium altitudes to high plateaus throughout the Western Plains and Rocky Mountains; an important forage grass, especially for sheep. Similar in habit but occupying limited portions of the western range and less important for grazing are P. CUSICKII Vasey (2), P. EPILIS Scribn. (3), and P. VASEYOCHLOA Scribn. (4).

Claviceps purpurea (Fr.) Tul., ergot. Utah (1).
Entyloma irregulare Johans., pale leaf smut. Wash. (4)
Erysiphe graminis DC., powdery mildew. Wyo. (2); Oreg., Wash. (4)
Lophodermium arundinaceum (Schrad. ex Fr.) Chev. on dead culms. Colo. (1)
Phytophthora sp., leaf spot. Oreg. (4)
Puccinia crandallii Pam. & Hume (II, III), rust. Colo. (1)
P. graminis Pers. var. poae Eriks. (II, III), stem rust. Wash. (2, 3)
P. poae-sudeticae (West.) Jørst. (II, III), yellow leaf rust. Utah (1); Wash. (2, 3, 4); Wyo. (2,3)
P. rubigo-vera (DC.) Wint. (II, III), orange leaf rust. Colo., Utah (1); Wash. (2). The var. agropyri (Eriks.) Arth. identified.
Scolecotrichum graminis Fckl., brown stripe. Wyo. (3)
Selenophoma donacis (Pass.) Sprague & A. G. Johns. var., speckle. Wyo. (3)

POA PRATENSIS L., KENTUCKY BLUEGRASS (1). Turf-forming perennial of Europe, cultivated throughout the humid middle and northern parts of the U. S., where it is the principal lawn and pasture grass; also widely naturalized. P. ARIDA Vasey, PLAINS B. (2), occurring in the western prairies and plains at low altitudes, is the bluegrass counterpart in dry regions. P. ARCTICA R.Br., ARCTIC B. (3), occurs in high mountain meadows in the Cascade and Rocky Mountains.

Ascochyta graminicola Sacc., leaf spot. N. Car., N. Dak., Ohio, Tex., Wash. (1)
Cercosporella poagena Sprague, leaf spot. Oreg. (1)
Cladosporium herbarum Pers. ex Lk., leaf and seed mold. Ind., Mont., N. J., N. Dak., Wyo. (1). Also reported as Mycosphaerella tulasnei Jacz.
Claviceps purpurea (Fr.) Tul. (C. microcephala (Wallr.) Tul.), ergot. N. Y. to Ky., Okla. and Mont. (1)
Colletotrichum graminicolum (Ces.) G. W. Wils., anthracnose. N. Y. to Ky., Tex. and N. Dak. (1)
Curvularia sp., leaf mold. Va.
Cuscuta sp., dodder. Mo.
Dinemasporium graminum Lev., on fading leaves. Kans., N. Car. (1)
Entyloma crastophilum Sacc., dark leaf smut. Oreg. (1)
E. irregulare Johans., pale leaf smut. Ill., Minn., Oreg., Pa., Va., Wash.
E. spragueanum Zundel, leaf smut. N. Dak.
Epichloë typhina (Pers. ex Fr.) Tul., cat-tail. Del.

POA PRATENSIS, etc., cont.

Erysiphe graminis DC., powdery mildew. General (1); N. Dak. (2)

Fusarium graminearum Schwaabe, culm rot. Wis., Wyo. (1). Conidial stage of Gibberella zeae (Schw.) Petch

F. heterosporum Nees, head mold, often associated with ergot. Ill. (1)

F. nivale (Fr.) Ces., snow mold. Mich., Minn., Oreg. (1). Conidial stage of Calonectria graminicola (Berk. & Br.) Wr.

F. poae (Pk.) Wr., silver top (head blight). Iowa, N. Y. (1).

F. scirpi C. R. Lambert & Fautr. var. acuminatum (Ell. & Ev.) Wr., secondary root rot. Nebr., N. & S. Dak. (1); N. Dak. (2)

Gloeosporium graminum Rostr., on fading leaves. Oreg. (1)

Helminthosporium giganteum Heald & Wolf, zonate eye spot. Md. (1)

H. sativum Pam. King & Bakke, root and stem rot. N. Y., N. Dak., Tex. (1)

H. vagans Drechs., leaf spot, sheath rot. General in Northeastern and Central States, also Pacific Northwest (1).

Hendersonia simplex Schroet., on fading leaves. N. Dak.

Macrophoma oblongata Tehon, on culms. Ill.

Physarum cinereum (Batsch.) Pers., slime mold. Mass. to Ky. and Iowa.

Puccinia graminis Pers. var. poae Eriks. & Henn. (II, III), stem rust. Ill., Ind., Md., N. Car., Ohio (1); Mich., Nebr., Tex. (2); Mich. (3)

P. poae-sudeticae (West.) Jørst. (II, III), yellow leaf rust. Me. to N. Car., Mo., and Wash.; general east of Rocky Mountains (1); Colo., Mont., Nebr., N. Dak., Wash. (2)

P. rubigo-vera (DC.) Wint. (II, III), orange leaf rust. Occasional throughout the range, N. Y. to N. Car., Calif. and Wash. (1); Mont., Nebr. (2)

Rhizoctonia solani Kuehn, brown patch. Cosmopolitan (1)

Sclerotium sp. (? Sclerotinia homoeocarpa F. T. Bennett), dollar patch. Mass., occasional in humid portions of range, reported but not confirmed in the West.

S. rhizodes Auers., leaf rot. Pa., Wis. (1)

Scolecotrichum graminis Fckl., brown stripe. N. Y. to Iowa and Mont., also Alaska (1); N. Dak. (2)

Selenophoma sp., leaf spot. N. Dak. (2)

S. donacis (Pass.) Sprague & A. G. Johns., speckle. Mont., N. Dak., Wyo (1); Mont. (3)

Septoria graminum Desm. Records under this name are probably referable to other spp., mostly S. macropoda var. septulata.

S. macropoda Pass. var. septulata (Gonz.Frag.) Sprague, purple leaf blotch. Mich. to Va., Tenn., Oreg., and Wash., probably general (1).

S. macropoda var. ---, leaf blotch. S. Dak. (2)

S. nodorum Berk., glume spot. Ark., Md., N. & S. Dak., Ohio, Oreg., Wis. (1).

S. oudemansii Sacc., tan leaf spot. Mich. to Ky., Nebr., Oreg. and Wash.

Sphaeropsis sp., on seed. N. Dak. (1)

Typhula itoana Imai, snow mold. Minn.

Urocystis agropyri (Preuss) Schroet., flag smut. Calif., Mich., Pa., Wash. (1)

POA PRATENSIS, etc., conc.

Uromyces dactylidis Otth (U. poae Rabh.) (II, III), leaf rust. Ind., Mich., S. Dak., Vt. (1). C and I on Ranunculus repens L.

Ustilago striaeformis (West.) Niessl, stripe smut. Mass. to Va., Mo. and Minn.; occasional in the West as N. Mex., Utah, Wash. (1). The form on this host has been designated poae-pratensis W. H. Davis.

Wojnowicia graminis (McAlp.) Sacc. & D. Sacc., seed mold. Mont., N. Dak., Wyo.

Bends -- cause unknown. Mich.

POA SANDBERGII Vasey (P. secunda Presl), SANDBERG BLUEGRASS (1). Perennial bunchgrass of plains, foothills and ridge tops in the Western States from N. Dak. to N. Mex., Calif. and Wash.; a valuable forage grass on dry and poor soils. Related spp., of generally similar or less extensive range and of less importance as forage, include P. AMPLA Merr., BIG B. (2), P. CANBYI (Scribn.) Piper, CANBY B. (3), P. JUNCIFOLIA Scribn., ALKALI B. (4), P. NEVADENSIS Vasey, NEVADA B. (5), and P. SCABRELLA (Thurb.) Benth., PINE B. (6)

Cladosporium graminum Cda., leaf mold. Mont. (6)

Claviceps purpurea (Fr.) Tul., ergot. Ida. (2), Mont. (2, 3, 5), Oreg. (5), Wash. (1, 2, 3, 5), Wyo. (3)

Dilophospora alopecuri Fr., twist disease. Utah (1)

Entyloma irregulare Johans., pale leaf smut. Oreg. (4)

Epichloë typhina (Pers. ex Fr.) Tul., cat-tail. N. Dak. (1)

Erysiphe graminis DC., powdery mildew. Calif. (1), Mo. (6), Mont. (6), N. Dak. (3), Oreg. (1, 3, 4, 6), Wash. (1, 2, 3, 5, 6), Wyo. (3)

Fusarium equiseti (Cda.) Sacc., root rot. N. Dak. (1)

Helminthosporium sp., leaf spot. Mich. (2, 5)

H. poae Baudys, leaf spot. Wash. (1)

H. sativum Pam. King & Bakke, root rot. N. Dak. (1)

Hendersonia culmicola Sacc., on culms. Wash. (1)

Melanospora poae Griff., on dead culms. Wyo. (5)

Mycosphaerella sp., on leaves. Colo. (5), Wash. (1, 3)

M. tassiana (De N.) Johans. Oreg. (4)

Ophiobolus graminis Sacc., root rot. Wash. (3)

Pleospora karstenii Berl. & Vogl., leaf mold. Oreg. (6)

Puccinia graminis Pers. (II, III), stem rust. Calif. (3, 6), Mich. (3, 4, 5), N. Dak. (5), Oreg. (2), Wash. (2, 3, 4, 5, 6), Wyo. (3). Probably the var. poae Eriks. & Henn. in all cases.

P. poae-sudeticae (West.) Jørst. (II, III), yellow leaf rust. Calif. (5, 6), Ida. (2), Iowa (2), Mich. (1, 2, 3), Nev. (3), N. Dak. (3), Oreg. (2, 4), Wash. (1, 2, 3, 4, 5, 6), Wyo. (3).

P. rubigo-vera (DC.) Wint. (II, III), orange leaf rust. Calif. (1, 3, 5, 6), Colo. (3, 4), Ida. (1, 2, 3, 4, 5, 6), Oreg. (2), Wash. (2, 6), Wyo. (3, 5). In some records designated as var. agropyri (Eriks.) Arth.

POA SANDBERGII, etc., conc.

Pythium debaryanum Hesse, and P. ultimum Trow., root necrosis. N. Dak. (1, 2)

Scolecotrichum graminis Fckl., brown stripe. Mich. (5), Mont. (2, 3), N. Dak. (1, 3), Oreg. (5), Wash. (2), Wyo. (5).

Selenophoma donacis (Pass.) Sprague & A. G. Johns. var., speckle. N. Dak. (1); Oreg. (2, 4), Wash. (1, 2, 4), Wyo. (1)

Septoria macropoda Pass. var. ---, purple leaf spot. Calif. (5), Mont. (1, 3), N. & S. Dak. (1), Oreg. (1, 2, 5), Wash. (1, 2, 6), Wyo. (1)

S. oudemansii Sacc., tan leaf spot. N. Dak. (1, 3, 5); Oreg., Wash. (1)

Urocystis agropyri (Preuss) Schroet., flag smut. Wyo. (2)

Uromyces dactylidis Otth (II, III), black leaf rust. N. Dak. (1), Oreg. (6)

Ustilago hypodytes (Schlecht.) Fr., stem smut. Nev. (6), Wash. (2, 3, 4, 5)

U. striaeformis (West.) Niessl, stripe smut. N. Dak. (3), Wyo. (1)

Bends -- cause unknown. Wash. (1, 3, 5)

POA TRIVIALIS L., ROUGH BLUEGRASS (1). Perennial of Europe, cult. in grass mixtures in meadows chiefly in humid regions as the Northeastern States and north Pacific Coast, and occasionally escaped. P. BULBOSA L., BULBOUS B. (2), and P. PALUSTRIS L., FOWL B. (3), of Eurasian origin, are of minor economic importance as meadow grasses and are naturalized, the former sparsely, the latter widely, in humid regions. P. INTERIOR Rydb. (P. nemoralis of some American authors), INLAND B. (4), a native meadow grass of medium altitudes in the Rocky Mountains and in the Northeastern and Lakes States, is of minor forage value.

Claviceps purpurea (Fr.) Tul., ergot. N. Dak. (3)

Epichloë typhina (Pers. ex Fr.) Tul., cat-tail. Del., N. Y. (3)

Erysiphe graminis DC., powdery mildew. Me. (4), Mich. (3), Minn. (4), Mont. (3, 4), N. Dak. (3), Oreg. (3), S. Dak. (4), Wash. (3, 4), Wyo. (3, 4).

Fusarium equiseti (Cda.) Sacc. and F. scirpi C. R. Lambert & Fautr. var. acuminatum (Ell. & Ev.) Wr., secondary root rot. N. Dak. (3)

Helminthosporium poae Baudys, leaf spot. Oreg. (1)

H. sativum Pam. King & Bakke, root rot. N. Dak. (2, 3)

Mycosphaerella tulasnei Jacz., leaf mold. S. Dak. (3)

(Napicladium gramineum Pk.): Scolecotrichum graminis

Pleospora vagans Niessl, on leaves. N. Dak. (3)

Pseudoplea trifolii (Rostr.) Petr., on dead leaves. N. Y.

Puccinia graminis Pers. (II, III), stem rust. N. Dak. (2), Tex. (1), Wash. (3, 4)

P. poae-sudeticae (West.) Jørst. (II, III), yellow leaf rust. Colo. (3, 4), Ida. (3, 4), Mont. (3), N. Y (3), Oreg. (1, 3, 4), Wash. (1, 2, 3, 4), W. Va. (3), Wis. (3)

P. rubigo-vera (DC.) Wint. (II, III), orange leaf rust. Colo. (4)

POA TRIVIALIS, etc., conc.

Pythium debaryanum Hesse, damping-off. N. Dak. (2, 3)
Ramularia graminicola Pk., leaf spot. N. Y. (3)
Rhizoctonia solani Kuehn, brown patch, root rot. Widespread (1), Minn. (3), N. Dak. (2)
Scolecotrichum graminis Fckl., brown stripe. Ind. (4), Minn. (3), N. Y. (1, 4), Wash. (3)
Selenophoma donacis (Pass.) Sprague & A.G.Johns. var., speckle. Mont. (4)
Septoria nodorum Berk., leaf and glume blotch. S. Dak. (3)
Ustilago hypodytes (Schlecht.) Fr., stem smut. Wash. (3)
U. striaeformis (West.) Niessl, stripe smut. Conn. (1); S. Dak., Wash. (3)

DIVISION OF MYCOLOGY AND DISEASE SURVEY

OBSERVATIONS ON RUSTS AND OTHER CONDITIONS AFFECTING SMALL GRAINS IN THE CENTRAL AND SOUTHERN PLAINS REGION

Donald G. Fletcher[1]

A crop and rust inspection trip was made April 26 to May 13. Cool cloudy weather was encountered throughout most of the trip and soil moisture was adequate except in 2 or 3 areas.

The territory visited included the Monterrey and Saltillo areas in Northern Mexico, Central Texas from Laredo on the south to Sherman, Gainesville, and Wichita Falls near the Oklahoma border, most of the grain-growing territory in Oklahoma except the extreme western panhandle, Central Kansas west to the vicinity of Dodge City, Western Missouri, Southeastern Nebraska, and Western Iowa.

Three seasons with insufficient irrigation water and rainfall have caused a great reduction in wheat growing in the section of Mexico visited. Although some fields showed considerable stem rust [Puccinia graminis] in the black stage, indicating that rust had overwintered as usual, the quantity of uredospores present on the grain was much smaller than usual. This same situation existed in that section of South-central Texas in which stem rust has been known to overwinter in the past.

The northern limit at which stem rust of wheat was found on May 9 was slightly south of the Oklahoma-Texas border near Dallas. Only a few stem rust pustules were found in most fields north of Dallas, and these only after searching for 5 to 10 minutes.

Stem rust of oats was limited to the same area in Texas and, while somewhat more abundant than the stem rust of wheat, the infection is much lighter than usual, considering the date and the maturity of the grain. A few fields of oats in South-central Texas are now ripe but most are in the early dough, and 1 to 2 weeks from harvest. While crown rust [P. coronata] was present in considerable quantities in all fields in Texas, the severity of infection decreased northward in Oklahoma to only a trace in the northern counties.

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[1] Executive Secretary, Conference for the Prevention of Grain Rust, Minneapolis, Minnesota

Only 10% of the wheat in Texas is produced in the north-central region east of Wichita Falls. Nearly 90% is produced west and north of this in the Panhandle. Thus, even heavy losses in the territory I visited would have little effect on the total wheat production for the State. However, the area is very important as a region in which diseases, especially stem rust and leaf rust [P. rubigo-vera var. tritici], may build up in quantity and create a huge source of rust spores which may be blown north to Oklahoma, Kansas, Missouri, Nebraska, and the spring wheat States if the winds are right.

Fortunately, in so far as stem rust is concerned, its overwintering and development in the Far South this year has been much lighter than usual, so that wind-blown rust spores from that source will be less likely to be numerous enough to cause widespread damage in the winter wheat area to the north. What might happen in the spring wheat area is as yet problematical.

Leaf rust this year overwintered abundantly as far north as Southern Minnesota. An unusually mild winter in the winter wheat producing areas of the Southwest allowed rust to live and increase in central Texas and Oklahoma to the point where 75 to 90% of the leaf tissue was killed by the time the plants headed. Controlled experiments have shown that such heavy infection at this stage of development usually causes losses of at least 20 to 30%. Smaller kernels and less kernels per head are the usual results, but in extreme cases actual shriveling, prevention of heading, or higher losses may occur.

Fields throughout Texas and Oklahoma are yellow because of heavy leaf rust, leaf killing caused by Septoria [tritici], and unbalanced plant food due to too much moisture. Nitrogen is noticeably lacking. It is hard to estimate the proportionate responsibility of leaf rust and Septoria in the death of leaf tissue in the fields but, in the hard wheat area of Kansas where leaf infection is light, 25 to 35% of the leaves were killed by Septoria. No noticeable varietal differences in resistance to Septoria were observed anywhere.

Leaf rust in the hard wheat in Kansas is definitely less severe than in Oklahoma or Texas. From reports and the looks of the plants, it would appear that leaf rust survived the winter as abundantly in Kansas as in Oklahoma, but a freeze in Kansas during April killed most of the leaves, and a large proportion of the leaf rust was eliminated. A rosette of dead leaves at the base of the plants was found uniformly in every field visited in Kansas. Leaf rust infection may become very severe in Kansas by harvest time, but the crop will not have been subjected to the heavy continuous attack the Oklahoma wheat had ever since the seedling stage. Therefore, the damage caused by leaf rust should be considerably less in Kansas.

Leaf rust in Southeastern Nebraska was slightly heavier than in North-central Kansas, but still very light in comparison to the situation in Oklahoma. In Iowa and Minnesota leaf rust is easy to find, but in all 3 of these States the grain is so far from harvest that no estimate of disease development is possible at this time.

Wheat in North-central Texas is mostly in the flower to milk stage. Fair stands are the rule, but short heads and small kernels will probably result in yields averaging 12 to 15 bushels.

The earliest wheat in Oklahoma was found as usual around Grandfield.

Excellent stands, now in the milk and early dough stages, should produce many yields of 20 to 25 bushels in this area. In spite of the damage that leaf rust, Septoria, and root rot have already done and will do in Oklahoma, normal May and June temperatures with considerable sunshine from now on should result in an average yield of 12 to 15 bushels for the State. This yield on the large acreage planted should produce between 60 and 75 million bushels.

Kansas acreage is reported to be larger than usual. Soil moisture, with the exception of a few limited spots, is deep and adequate. In fact, the best thing that could happen for the crops of the eastern half of the State would be for the weather to turn warm, dry and sunshiny. Although the wheat crop is somewhat late, heat and sunshine would help it catch up. The stands and their condition, as of last week, indicated an average yield of 15 to 18 bushels for the State. Most of the Kansas wheat seen was in the boot or the jointing stage, with harvest about 6 weeks away.

Reports for Michigan, Wisconsin, Iowa, and Minnesota show that common barberries rusted earlier this year than ever before. No spread to grains or grasses has yet been observed, and it is hoped that no widespread epidemic will result from this unusually early infection.

CONFERENCE FOR THE PREVENTION OF GRAIN RUST

LEAF RUST ON WINTER WHEAT IN MINNESOTA AND SOUTH DAKOTA

Ian W. Tervet

Because of the early widespread occurrence of leaf rust (Puccinia rubigo-vera var. tritici) in the central and southern areas of the hard red winter wheat belt, an early spread of this disease to the winter wheat region of Minnesota and South Dakota was expected. The warm weather of March favored early spring growth of wheat in Minnesota and South Dakota, and little winter-killing was evident throughout this territory. The weather during most of April and May has been cool, heavy freezes occurring as late as the nights of May 7, 8, and 9, with light snow on May 9. Relatively little winter wheat is now grown in Southern Minnesota, most of the acreage being in the south-central and southeastern counties. In South Dakota, winter wheat is grown generally across the southern part of the State, excepting the southeastern section.

A survey of the winter wheat area was begun on April 30 and continued during the succeeding 10 days. Southeastern Minnesota was examined first on April 30 and May 1. Leaf rust was found as far north as Hastings, about 20 miles south of St. Paul, on April 30. Infection was limited to single pustules on a very few leaves, never more than one infected leaf per plant, a search of about 10 minutes being required to find an infected leaf in the first field examined. On April 30 and May 1 every wheat field seen east of a line from St. Paul south to Austin was examined and leaf rust was found in approximately half of these fields. Again only single pustules per leaf were found. It is probable that leaf rust could have been found in every field if a continued search had been made, but a limit of 10 minutes searching per field was maintained. Leaf rust was not found in any field in Washington and Ramsey Counties north of Hastings. One other report on leaf rust has been made in Minnesota. Mr. E. A. Andrews of the

Department of Plant Pathology, University of Minnesota, found a few pustules on Minturki wheat in plots at the Waseca Experiment Station on April 28. No winter wheat fields were seen in Southwestern Minnesota.

In South Dakota, the leaf rust survey was begun on May 3 at Brookings and was continued until May 10, the area covered being from Brookings through Chamberlain to the Black Hills, returning along the South Dakota-Nebraska line to Vermillion and then north to Brookings. Leaf rust was found in all fields seen east of a line from Chaberlain southwest to Winner. West of this line, no trace of leaf rust was seen, despite continued search in many fields. The prevalence and severity of leaf rust was slightly greater in Eastern South Dakota than in Southeastern Minnesota. One field, about 30 miles southeast of Chamberlain, was more heavily infected than any other field in the vicinity. This field had about 30% of the plants infected; individual leaves also were more heavily infected, up to 10 pustules being found per leaf, although the average number of pustules per leaf would not exceed 3. Only the 2 or 3 oldest green leaves had pustules. Adjacent fields were less heavily infected, usually a single pustule being found per infected leaf and with less than 1% of the plants having any rust. There was no evidence in the most heavily infected field that local overwintering of the rust had occurred, nor were any overwintering pustules seen in any field in Minnesota or South Dakota. (Rye fields in South Dakota and Minnesota appeared free from leaf rust; overwintering of Puccinia dispersa [P. rubigo-vera var. secalis] apparently did not occur.)

Speckled leaf blotch (Septoria tritici) was found in all fields and had caused the death of many of the lower leaves. Some of the injury evidently had occurred last fall, but there seemed to be some killing of this season's growth.

Powdery mildew (Erysiphe graminis var. tritici) was found in all fields in Southeastern Minnesota but not elsewhere. Infection was very light.

The condition of winter wheat is good in most sections east of the Missouri River but is spotted westward in South Dakota. In the west-central and southwestern parts of South Dakota there is a decided moisture deficit and some of the wheat sown on poor seedbeds last fall has made little growth. Wheat in the western section that got a good start last fall is vigorous and is not suffering yet from lack of moisture.

EMERGENCY PLANT DISEASE PREVENTION PROJECT

ENVIRONMENTAL CONDITIONS AND WHEAT DISEASES IN KANSAS AND OKLAHOMA

C. O. Johnston

Weather Conditions and Disease Developments at Manhattan, Kansas, and Vicinity during April. April was a cold, rainy, cloudy month in this location. Rain fell on 13 days for a total of 7.87 inches, which is 5.2 inches above normal for the month. Except for brief intervals of a day or two the wind was in the north or east most of the time and periods of cold raw weather occurred every few days throughout the month. A hard freeze on the night of April 4 destroyed considerable fruit, damaged much alfalfa, and injured a little winter wheat but the damage to cereals in general was very slight.

Leaf rust of wheat, which overwintered in considerable abundance throughout the State and was present in nearly every field on April 1, did not increase much during the month except in south-central and southeastern counties. In those parts of the State some wheat was knee-high on April 21 and was rusted from bottom to top with a severity up to 40%. Plants dug in southern Kansas on that day, having 25% rust up to mid-height and only flecking on upper leaves, developed 25% infection on upper leaves within 10 days after being potted in the greenhouse. Infection as heavy as that developing before heading is almost certain to cause considerable damage.

Examination of several fields near Manhattan, May 1, revealed that leaf rust is abundant on lower leaves, is just breaking out on the second leaf below the flag leaf, and is abundant as flecks on the first leaf below the flag. There are few to no signs of infection on the flag leaf, although in many cases that leaf is not yet fully exserted. The recent cold weather undoubtedly has reduced the rate of development of the rust but infection is so abundant and so widely distributed that it is certain to increase rapidly as soon as temperatures rise a little. It is much warmer today although there was frost last night. The soil in wheat fields is still wet and heavy dews occur regularly. Under such conditions a large increase in leaf rust can be expected very shortly.

No stem rust has been seen or reported in the State.

In the central and western part of the State large acreages of wheat are extremely chlorotic. That apparently is due to the heavy, early-season top growth using all available nitrates followed by a long period of temperatures too low for rapid nitrification. There also has been a serious shortage of moisture in many western counties until recently.

Cereal Diseases Observed in Kansas and Northern Oklahoma, May 8-11. During the period of May 8 to 11, inclusive, the writer, accompanied by Dr. Hurley Fellows, made a trip through the wheat growing area of Central, South-central, and Southeastern Kansas and North-central Oklahoma for the purpose of making disease and other observations on the winter wheat crop in that area. The trip was made at that time to check on the reports of heavy infections of leaf rust and Septoria tritici developing on wheat before heading. Plants heavily infected by either disease that early in the season are almost certain to suffer serious reductions in yield.

Wheat was observed in 20 counties in Kansas and 4 counties in North-central Oklahoma. In Kansas the only wheat in head was Early Blackhull in counties along the southern border. Other varieties varied greatly in stage of growth from plants less than one foot tall to plants in the late boot stage. The outstanding feature in Kansas was the vast acreage of yellow wheat. This condition probably was brought on by a combination of cold weather, too much rain, and a shortage of nitrates. In many fields only the upper 2 or 3 leaves remain green and even those are a pale yellowish-green instead of the deep rich green expected at this time of year.

Another growth feature prominent in many Kansas fields is thin stands. This apparently was caused by lack of abundant tillering. The wheat in the drill rows seems thin. In addition, much of the crop is in the boot stage although the plants are less than knee-high. When warm weather finally arrives such plants may stretch considerably but the present in-

dication is that many fields will be short and thin.

In Oklahoma, Early Blackhull and Early Triumph were blooming, while other varieties were still in the boot. There also the crop in general was yellow and in many cases unthrifty in appearance with stands thinner than normal. In both Kansas and Oklahoma the reason for much of the trouble undoubtedly lies in the long period of cold wet weather during April and May. Water was standing in many fields and many already have large spots in which the plants have been killed by water. The soil over a large area in both States is very soggy.

Both leaf rust and speckled leaf blotch are present in abundance in all parts of the area covered. However, the low temperatures of the past month have held leaf rust in check, while it appears to have favored the leaf blotch. For the area as a whole leaf blotch on the lower half of the plants is much more conspicuous than leaf rust. Both of the diseases are progressing upward toward the flag leaves but only in Barber, Harper, and Sumner Counties in Kansas and Kay, Grant, Garfield and Noble Counties in Oklahoma was leaf rust infection heavy on the flag leaves. In that area many fields not yet in head had 25 to 40% infection on flag leaves.

In the northern, western, and eastern parts of the area surveyed, leaf rust infection ranged around 5% on lower leaves and traces on flag leaves, but flecking was heavy on all leaves except the flag, indicating that heavy infection will develop quickly as soon as the temperature rises. This suggests that heavy infections can be expected near flowering time. Should that occur there will be considerable rust damage. Those fields in which heavy infection already has reached the flag leaf undoubtedly will be damaged. Speckled leaf blotch also is certain to do considerable damage over the area. In some fields only the top 2 leaves remain functional, the others having been dried up by leaf blotch.

No stem rust was seen on any of the cereal crops, but heavy infections of leaf rust were noted on rye [Puccinia rubigo-vera var. secalis] and winter barley [P. anomala]. Powdery mildew also was abundant on winter barley and was seen also in a few wheat fields.

DIVISION OF CEREAL CROPS AND DISEASES

OTHER REPORTS ON CEREAL DISEASES IN THE GREAT PLAINS REGION

DISEASES OBSERVED ON WHEAT AND RYE IN KANSAS: A total of 75 wheat fields in Eastern Kansas was examined. Rainfall has been adequate to excessive in all parts of the area, and many waterlogged fields were seen. Despite heavy and frequent rains, orange leaf rust has not increased as rapidly as might be expected. This may be due to the cool weather prevailing.

The heaviest leaf rust was seen in the south-central area, in Sumner, Cowley, Chautauqua, Butler, Sedgwick, Kingman, Barber, Harper and Montgomery Counties.

No black stem rust has yet been seen in any part of Kansas up to and including May 12.

Speckled leaf blotch has increased greatly during the last fortnight. Many fields in Eastern Kansas have been seen in which Septoria infections may beeseen in all parts of the plants, even on the flag leaves, with the lower leaves nearly dead from the crowded lesions.

Orange leaf rust was seen in all of the 11 rye fields examined. Its attack was heavy in one field in Montgomery County, moderate to light in the other fields seen.

Speckled leaf blotch (Septoria secalis) of rye was seen in moderate to plentiful amounts in all fields examined. The heaviest infections were seen in the the 3 southeastern counties of Crawford, Cherokee, and Labette.--C. M. Slagg, Emergency Plant Disease Prevention Project

WEATHER CONDITIONS AND CEREAL DISEASE DEVELOPMENTS AT DENTON, TEXAS, DURING APRIL: The excessive precipitation, which started in February, continues. Total precipitation for April was 5.08 inches, which is 1.11 inches above normal and brings the total since January 1 to more than 18 inches. Average precipitation for the year at this station is about 33 inches. A measurable amount of rain was recorded on 12 days in April, and a trace on 3 additional days. Dews were recorded on 17 days in April. Temperatures were quite variable, ranging from a minimum of 32° F with heavy frost on the 5th to a maximum of 85° on the 25th. Alternate cool and warm periods of from 2 to 5 days were the rule. The mean temperature for the month was 62.8° F, which is 1.3° below normal.

Crown rust of oats is prevalent and the most severe ever observed this early in the season. Fulwin and Lee x Fulghum (C.I. 4080) are so seriously injured that they will probably produce less than 15 bushels per acre, whereas adjoining plots of rust-resistant strains may make 50 to 60 bushels per acre.

Stem rust of oats has not spread very fast owing to cool weather.

Leaf rust of wheat, combined with Septoria [tritici], has caused serious damage to all varieties. Relatively few strains show high resistance to Septoria this year; many strains that were resistant in previous years are susceptible.

Leaf rust reaction has been unusual. During the winter months the Mediterrannean strains, which we formerly considered resistant, plus certain Hope-Mediterranean strains, including Austin, were moderately rusted. In the last 2 weeks these strains have become resistant and now show little rust, while some strains, which were resistant during the early months,are now rusted. This is especially true of Westar, which showed high resistance all winter and now is rather heavily rusted. Hope wheat and Hope-derived varieties were heavily rusted a few weeks ago but are becoming more resistant. Red Egyptian and several South American varieties -- Sinvalocho, El Milagro, I.F. 1050, and I.F. 1054 -- have been resistant throughout the season.

Stem rust of wheat has just appeared in the experimental plantings but we have not had an opportunity to inspect commercial fields to see how prevalent it is.--I. M. Atkins, Division of Cereal Crops and Diseases.

OBSERVATIONS ON UNUSUAL BEAN DISEASE SYMPTOMS[1]

Earle C. Blodgett and Herman K. Schultz[2]

In connection with surveys by the Emergency Plant Disease Prevention Project during the season of 1944, the senior writer's attention was directed to what apparently are unusual disease symptoms occurring on beans in 4 distinct areas of his survey territory. Of special interest is the occurrence of these troubles in certain bean crosses and in their progenies as studied by the junior writer. It has seemed desirable to record the information and distribution as now known. In view of some other experimental work now in progress, and until more is known about the etiology of these diseases or complexes, no specific names are suggested here.

Areas Surveyed

Spokane Valley, Washington. On August 7, 9, and 12, several fields of beans were examined in the Spokane Valley, where a rather large acreage (about 2000 acres) of various kinds of dry and seed beans has been grown, usually on the same land, for the past 6 to 10 years. The soil is very gravely, making irrigation necessarily quite frequent after early spring.

Northern Idaho. On August 15 and 17, extensive surveys were made in Latah, Nez Perce, and Clearwater Counties, where about 17,000 acres of small white, small red, and garden varieties of beans were grown in 1944. The soil is mainly of a silt loam and crops are grown with a rainfall of about 25 inches. Beans are drilled quite thickly into rows 3 feet apart in this area. The crop has been grown for 15 or 20 years in a suitable rotation.

Plots, Idaho Agricultural Experiment Station, Moscow. On August 24 the bean breeding and trial plots on the University Farm at Moscow were examined. Here crops are grown on a silt loam soil characteristic of the Palouse area, with an average rainfall of about 22 inches. Plants in the nursery were spaced 15 inches apart in rows 3 feet apart, while "increase" plantings were in much thicker stands.

Southern Idaho. On September 11 to 16 further surveys were made in the bean-growing areas of Southern Idaho in the neighborhoods of Gooding, Richfield, Jerome, Buhl, Filer, Twin Falls, Kimberly, Burley, Declo, and Rupert. Generally speaking, these localities include the main bean area, comprising 8 counties of the State and in 1943 representing about 141,300 acres of garden and field beans[3]. The texture of the soil is variable but is predominantly of a silt loam type. Irrigation is necessary, as the rainfall varies from about 8 to 15 inches. Attention to suitable rotation practices has frequently been neglected.

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[1]Published with the approval of the Directors of the Agricultural Experiment Stations of Washington and Idaho

[2]Pathologist, Emergency Plant Disease Prevention Project, Moscow, Idaho, and Associate Agronomist, Idaho Agricultural Experiment Station, Moscow, Idaho

[3]This figure taken from information furnished through the courtesy of the offices of Richard C. Roos, Agricultural Statistician, Boise, Idaho

The disease complexes were first noted in the Spokane Valley, where a seed company field man called the senior writer's attention to the unusual conditions.

Symptoms A

This condition is characterized by a uniform, very sudden wilting, which in a day or so changes the entire plant into a dried, green-colored, well-cured hay with leaves intact. In an occasional case, a lower branch may appear normal after the rest of the plant has died. Affected plants remain attached to the roots and so far as could be determined root rot was not involved, although it could be found in some fields. If the wilt occurs early, soon after the flowering stage, the plants die with no pod set, but if the plants are attacked later they may show wilted pods and shriveled seeds.

In nearly all of the cases observed, there was a slight to a very definite vascular discoloration in the fibrous roots, crown, and stem. In the Spokane, Northern Idaho, and Moscow areas, the affected plants wilted suddenly and apparently no other leaf symptoms were involved. Near Spokane, this "quick wilt" condition was observed on plants of the varieties Red Kidney, Bountiful, Black Valentine, Michelite, and Robust. No Blue Lake plantings were encountered. The amount of infection in Bountiful was the most severe observed, this amounting to approximately 10% in some fields. Growers and bean dealers stated that these symptoms had been observed in previous years, but that the amount was so slight that little concern was shown. Several growers claimed that the wilted plants were due to too close cultivation, while others felt that a new disease of importance was coming into their fields. Although most wilted plants occurred scattered throughout the fields, sometimes there were several together.

Near Gifford (northern Idaho area) one field of about 12 acres of Streamliner beans showed about 70% of the plants affected with this wilt. Plants attacked late yielded fairly well, but many of the pods were shriveled. Examination of this field 3 weeks earlier by a dealer indicated that about 20% of the plants were affected. The grower stated that beans were on this land 4 years ago and wheat in 1943. In another field, reportedly planted with same seed stock, only a trace of the disease was noted. A few plants showing Symptoms A were also found in small red (UI No. 34), small whites, and Bountiful. In small reds, the disease was apparently just beginning to show up, although a few plants were completely wilted.

It might of interest to state here that in severely wilted plants the nodules, often well developed, were partially disintegrated. There seemed to be some difference in nodule condition even on slightly affected plants when compared to nodules from disease-free plants.

At Moscow the bean nursery was located on the same plot of ground used in the previous season when no evidence of the condition was noted. Although a large number of plants of numerous varieties and their derivatives was grown in 1944, wilting was found only in the Blue Lake variety and among its various progenies. The plants in the nursery were large and those rows containing plants with Blue Lake inheritance could be detected from a considerable distance because of the conspicuous dead plants. Some of these rows were located in several parts of the nursery.

An F_2 population of 295 plants was grown of the cross Blue Lake x Burtner together with 50 plants each of the 2 parent varieties. The Burtner parent was wilt-free while the Blue Lake parent had 22 plants that succumbed to the disease described under Symptoms A. There were 61 wilted plants in the F_2 group. This group was composed of 3 progenies with all having about the same amount, 20%, of attacked plants. Other hybrid progenies grown were some natural crosses between F_1 plants of (Blue Lake x Burtner) and Red Kidney, Pinto, and Black Valentine. While the number of plants per progeny was small, between 8 and 37, there was from 5 to 55% killing of plants in this group of 10 progenies. All 3 of the last-named varieties were wilt-free and no definite differences could be ascertained as to their individual potency on resistance when in Blue Lake combinations.

It is not known how many, if any, of the susceptible plants escaped infection. The susceptible Blue Lake variety may be a heterogeneous group of types with respect to this disease reaction. The wilted individuals were quite randomly distributed among the healthy plants within progenies. Another F_2 planting of Blue Lake crosses is planned for 1945 on the same plot that was used for the 1944 and 1943 bean nurseries.

Symptoms B

This condition is characterized by an apparent lack of an active growing point in affected plants, by sparse pod-set or complete absence of pods, by very large, fleshy, upright braches that break off easily, and by premature, almost complete defoliation. Apparently, the first symptoms appear very early after emergence and in such cases the plants die before making much growth. In less severe cases, infected plants attain a moderate to nearly normal height but fruit very sparsely, No specific leaf symptoms were noted at the time of survey (August 7-12). Diseased plants were scattered promiscuously and there did not seem to be any centers of spread. The final general appearance of affected plants is that of a stub because when the leaves wither and fall and the upper branches have dropped off, only the stubby bean stalks are left. The infection in some fields is severe enough to be of considerable importance. This particular complex has been noted by growers and dealers in previous seasons and is often spoken of as "nubbins".

Near Spokane, it was observed on Bountiful (principally) and on Red Kidney and Black Valentine. In Northern Idaho, Symptoms B were found in Streamliner and Bountiful with only slight damage; but in Southern Idaho, traces to moderate amounts were noted on Bountiful, Plentiful, Tendergreen, Florida Belle, Giant Stringless, Streamliner, Burpee Stringless, and Great Northern (U.I. No. 123).

In the bean nursery at Moscow, this complex was found on Bountiful and Black Valentine. In Bountiful 29 out of 43 plants and in Black Valentine 22 out of 40 plants showed typical symptoms. Affected plants were randomly distributed within each variety row. A few stubby plants were found also in one of the (Blue Lake x Burtner) x Black Valentine crosses. For 1945 a number of early generation hybrids involving Bountiful will be available for further study.

Discussion

So far as is known, no report in the literature has dealt with the combinations of symptoms similar to those described herein. The causes of these conditions are not known and experimental work has not advanced far enough to predict probable trends. It appeared that the conditions described under Symptoms A and Symptoms B were quite distinguishable. Baldhead (thresher injury) is likely not to be involved since the nursery seed stocks were hand-threshed. The expression of both groups of symptoms may depend to a more or less extent on inherited tendences, and may be influenced by environmental factors; possibly viruses are involved.

Dr. M. E. Anderson, Idaho Falls, Idaho, in personal correspondence, stated that beans affected as described under Symptoms A were observed by him in plots in Southern Idaho in 1941. The affected plants showed very marked vascular discoloration and collapse of pod tissue although the attack was near pod maturity. Beans of the Blue Lake type were affected. Seeds from these plants grew normally in the greenhouse with no appearance of the disease.

Dr. E. J. Anderson, Washington State College, Pullman, Washington, grew 250 seeds from diseased Bountiful bean plants collected by the senior writer in the Spokane Valley in August, 1944, and no disease appeared in the stock under greenhouse conditions.

There is evidence that at least some similarity exists between Symptoms A and the virus disease, black root, described by Jenkins[4] in 1940. There are, however, certain apparent differences.

The complex described by Boyle[5] in Oregon, in which 7 types of symptoms were observed on the Blue Lake variety (of various strains) in the Willamette Valley, covers some of the conditions noted in Symptoms A as observed in Idaho and Washington.

It would seem, considering the varieties involved, that the disease complex in western Oregon is probably similar to the one observed by the writers on Blue Lake and its various progenies.

Just where the conditions described under Symptoms A will fit into the picture of bean diseases is unknown, but it is felt that this condition and that of Symptoms B require careful attention. Judging from observations and records made this year, these complexes are potentially serious problems.

EMERGENCY PLANT DISEASE PREVENTION PROJECT AND
IDAHO AGRICULTURAL EXPERIMENT STATION

REPORT ON CINCHONA DISEASES IN GUATEMALA

Otto A. Reinking

A rapid survey of the disease situation in Cinchona plantings was made from January 20 through January 22, 1943, on the following plantations in Guatemala: Experimental Plantations Inc., Finca el Naranjo at Chicacao, Finca Helvetia at Helvetia, and Finca El Zapote at Esquintla. Because of

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4 Jenkins, W. A. A new virus disease of snap beans. Jour. Agr. Res. 60: 279-288. 1940

5 Boyle, Lytton W. Bean diseases in the Willamette Valley of Oregon. U. S. Dept. Agric. Plant Dis. Rptr. 28: 859-860. 1944

the limited time available for the studies, they of necessity were incomplete, and the following comments should be regarded in this light. Rather thorough observations, however, were made, and it is believed that the main troubles were encountered as they were present during the time of inspection. Specimens of diseases were compared with the collections of the Bureau of Plant Industry Station at Beltsville, Maryland.

For these studies the following Cinchona species were present in the nursery and field plantings: C. ledgeriana, C. succirubra, C. calisaya, C. pubescens, and various hybrids.

Dr. J. R. Schuman, Geneticist of the Experimental Plantations Inc., and Dr. Albert Muller, Director of the Escuela Nacional de Agricultura at Chimaltenango, accompanied the writer. Dr. Muller, however, did not visit the Finca El Zapote on this trip. During the past few years Dr. Muller has made studies and prepared reports on Cinchona diseases observed on various plantations for the Experimental Plantations Inc., and data presented in his last report will be referred to from time to time.

Comments on the various diseases as well as the insect troubles found follow.

Seed-Bed Troubles

Damping-Off. Damping-off of seedlings in seed beds was observed to be present on all 3 Fincas visited. It was not serious in well-managed plantings and was regarded as being caused by the ordinary damping-off fungi found in practically all tropical soils. Dr. Muller reported having isolated a Rhizoctonia from affected plants. In Washington, D. C., after having made the present study, the writer had an opportunity to consult with Mr. Wm. Pennock of the Board of Economic Warfare, who had been employed by the Experimental Plantations Inc. on the Finca El Naranjo in Guatemala. Mr. Pennock reported a Pythium also present in seed beds affected by damping-off. Both of these fungi have been found by the writer to be universally present in the Tropics and to be capable of attacking almost all species of plants.

Damping-off control is simple. In his report Dr. Muller suggests using new soil for each new seed bed and soaking beds with bordeaux mixture in severe cases. The use of Yellow Cuprocide in place of bordeaux mixture should also be effective.

The disease was observed on C. ledgeriana and C. calisaya and undoubtedly could attack any species of Cinchona.

Post-Emergence Damping-Off. Beds with dead areas of young plants also were observed. In some instances severe damage was done. Mr. Pennock informed the writer that a Phytophthora had been isolated from plants thus affected. This conforms with the findings of others. The fungus is a common tropical parasite that may attack almost any plant in a succulent state of development. It will be discussed more in detail under die-back and stem canker of seedlings. The disease is readily controlled by spraying with bordeaux or with Yellow Cuprocide.

Seedling-Bed Troubles

Die-Back and Stem Canker of Seedlings. A die-back and stem canker

of nursery stock was rather prevalent. It is characterized by dying back and blackening of the young growing tips of plants, or by girdling of the stems of seedlings. It is frequently found in the graft region of plants. Attacked tips show wilting and death of affected parts; the disease may progress down the shoots and kill the entire seedling. Often, plants are attacked at the bases of leaf petioles; in these cases a blackened, sunken canker is produced on the stem that may girdle and kill the upper part of the plant. If this diseased portion is not cut off well below the point of infection, the disease may progress downward and kill the entire plant. Dr. Muller isolated a Phytophthora from diseased plants and assigned this organism as the cause.

On Finca El Naranjo the disease was observed on C. ledgeriana and C. calisaya. Judging from studies made in previous years it would be surprising to the writer if the Phytophthora would not attack all species of Cinchona.

The disease can readily be controlled by good cultural practices. When it gets out of hand it may be serious. In some beds at Finca El Naranjo 25% of the plants were diseased and had to be removed. Dr. Muller has suggesed the main controls: removal and burning of all badly infected plants, pruning of the infected tops well below the point of infection, thereby saving the healthy lower part, and finally, in severe cases, spraying with bordeaux mixture when this seems advisable. Because this disease is at its worst under conditions of high humidity it is further suggested that the plants in the nursery should not be crowded, so as to provide for plenty of aeration. Since the organism, also, is readily spread by water, plants in the nursery should never be sprayed with water, but should be watered by flooding the soil. All infected plants in the nursery bed should be destroyed, since infected plants carried to the field may die later with a stem or crown canker.

It is believed that by sanitation and by good cultural methods this disease can readily be held in check.

Field-Planting Troubles

Stem and Crown Canker. A stem and crown canker was observed in field plantings of trees at Finca El Naranjo, in the Helvetia plantings, and in the Finca El Zapote plantings. Dead and dying plants in the Finca El Naranjo were observed in the Lojaita commercial planting. These weakened and dead plants were ledgeriana grafts on succirubra. In each case the ledgeriana graft where it joined the succirubra stock was browned and dead. The dead area above the graft frequently was infected with a Nectria. This same trouble was described by Dr. Muller.

In one case 3 plants in a row were infected, but other affected plants were scattered and the disease did not appear to be general. Since the disease, in these cases, was confined to the graft area, it was thought that improper grafting often facilitated the entrace of a parasite. In most grafts a stump of the stock had been left which had died and seemed to weaken the union. Frequently the succirubra stock was much larger than the ledgeriana scion, indicating some incompatibility. Whether this is a factor in causing weakening and death of the scion is not known. In any event, the disease was mostly scattered in distribution, which would lead one to believe that it was not being caused by an epidemic fungus.

It is believed that the death of the grafted areas normally was due to poor grafting methods, thereby permitting entrance of a parasite, and the Nectria present on dead parts was secondary. This fungus is very widespread, and is often found on weakened and dead parts of many trees. An example on another host in the Finca El Naranjo was the presence of a Nectria on a dying Citrus tree.

Diseased and dead trees were studied also at the 5000-foot elevation planting on the Finca Helvetia. All these plants were budded. Only a plant here and there was observed to be dead. No Nectria was fruiting on the dead parts of these plants. The ledgeriana top was browned at the point of grafting, and as was true at Finca El Naranjo, the succirubra base was healthy. Here again, the young grafted plants seemed rather weak, and some young plants were blossoming, indicating weakened plants. Poor grafting or incompatibility of stock and scion seemed to weaken the grafted plants. Incompatibility may not be a complete explanation, for adjoining these young plants which were about 3 feet tall, were older, taller grafted plants which appeared to be entirely healthy. Apparently, when once the graft takes well the plants grow.

On Finca El Zapote only older trees, some 5 years old, were observed to be killed. These had a crown canker with a Nectria fruiting on the dead wood. The cause of this trouble is uncertain. Again, the death of the plants seemed to be caused by a canker disease most generally found at the grafted area. Apparently, some parasite gained entrance in these areas, causing the production of a canker and finally death of the tree.

Further studies are needed to determine the exact cause of the stem rot and canker. It is suggested that a Phytophthora or some other parasitic fungus be looked for, since as stated above, the Nectria frequently present on dead parts may be secondary.

Root Rot. Dead trees were observed in the Loja planting of P.I. (Plant Introduction, U. S. Department of Agriculture) seedlings on Finca El Naranjo and on similar P.I. seedlings in plot No. 2 on Finca El Zapote. The dead trees showed no signs of a canker on the trunk. Evidently the root system was diseased although no studies of the roots were made. At Finca El Zapote trees died in rows; in one row 15 plants had died. These same trees were severely affected with the unidentified leaf spot to be described later. The trees most severely affected in these plantings were of the narrow-leaf types, indicating ledgeriana parentage. Plants of C. succirubra in adjoining rows were not affected. Apparently, on Finca El Naranjo and Finca El Zapote the narrow-leaf types of P.I introductions were not adapted to the soil type on which they were planted, or these particular areas were infested with some root fungus. Dr. Muller reported the presence of a Rosellinia-like fungus on the roots of dead trees in the Finca El Naranjo planting.

P.I. seedlings on Finca Helvetia were making excellent growth. These were planted in 1936, and when observed the entire planting was in excellent condition with wonderful trees. Even the narrow-leaf varieties were doing well on their own roots. Apparently, in this instance, the soil conditions were right for the growth of this type of tree. On the other hand, if a fungus caused the disease in Finca El Naranjo and Finca El Zapote this fungus was not present in the soil at Finca Helvetia.

Further studies are essential to determine the exact cause of the death

of the trees in Finca El Naranjo and Finca El Zapote and in other areas.

Leaf Diseases

A number of different leaf diseases were observed on Cinchona during the inspection. Specimens were collected and taken to Washington, D. C., for final determination. Although the majority of leaf spots encountered were of minor importance they were studied in detail in order to distinguish them from what has been called the "Unidentified Leaf Spotting", which appeared to be serious in certain areas especially on the ledgeriana types and which seems to be due to some nutritional factor as will be discussed later. A number of insect troubles manifested primarily in the form of leaf spots also were encountered.

Sooty Mold. Leaves affected with sooty mold are characterized by a black fungus growth that may cover the entire leaf surface. In some cases the stems of plants may be covered with this growth. When the fungus growth is heavy, it may form sheets that may peel off. The fungus occurs only on leaves or stems of plants attacked by a large scale insect that produces a honeydew upon which the fungus lives. The fungus, therefore, is not parasitic and does not penetrate the leaf. It does damage only by preventing proper leaf functioning due to covering the leaf surface. The real injury to the plant is caused by the scale. The control of this fungus, when necessary, consists in controlling the scale insect by spraying with an insecticide. The trouble was observed on only a few plants in Finca Helvetia. The same black mold and presumably the same scale insect was observed on coffee plants in the same plantation. The disease is of little or no economic importance. The fungus is a species of Capnodium, and the scale insect is Saissetia hemisphaerica (Targ.) as determined for the writer by Dr. Harold Morrison of the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

Algal Leaf Spot. The algal leaf spot is characterized by circular, raised, light reddish brown spots with some light green, occurring primarily on the upper surface of the leaf. The alga does penetrate the leaf tissue but generally does little damage. The disease was observed on trees at Finca Helvetia and Finca El Zapote. It was more commonly found at the higher altitudes where the humidity was high. In addition to the alga, some lichens were observed on leaves. The disease seemed to be of no economic importance. A similar algal leaf spot was present on coffee leaves in the same areas. The alga causing the trouble is generally recognized as Cephaleuros virescens.

Leaf Scorch. Leaf scorch is characterized by red-brown scorched areas extending from the margin of the leaves inward, often penetrating to the mid-rib. It is thought to be caused by sunburning of weakened leaves and therefore is of a non-parasitic nature. The disease is of little or no importance.

General Leaf Reddening. One symptom of a weakened and dying tree is a general reddening of the leaves from the margins inward. Frequently the entire leaf turns red. These symptoms were observed on the narrow-leaf ledgeriana and the broader-leaf hybrid types. The symptoms indicate

a weakened tree and are not caused by a leaf fungus. Often abnormal weather conditions produce a general leaf reddening.

Black Blotching. On Finca Helvetia a black blotching was observed on leaves covered with pumice from the active volcana Santa Maria. The blackening was thought to be due to the rubbing and consequent injury of pumice covered leaves.

Leaf Mottle or Chlorosis. The leaf mottle or chlorosis observed on plants growing on all 3 Fincas is characterized by a yellowish-green mottling of the leaf usually between the main lateral veins. The trouble is believed to be nutritional. No true virus troubles were observed. Chlorotic symptoms also were observed on weak trees. The trouble was most commonly observed on Finca El Zapote in Plot No. 6, where plants were growing under coffee shade trees.

Unidentified Leaf Spot. An unidentified leaf spot was commonly found in all 3 fincas. It apparently is most prevalent on the narrow-leaf ledgeriana strains and hybrids and frequently is associated with weakened trees, although badly diseased leaves were observed on apparently healthy plants also. Apparently the same trouble was observed on Cinchona ledgeriana, C. succirubra, C. calisaya, and on hybrids. It appeared to be less severe on C. succirubra and C. calisaya. The disease as observed was most prevalent on Finca El Zapote and Finca El Naranjo. Less was observed on Finca Helvetia. Some spotting, however, was observed on grafted ledgeriana plants growing at the 5000-foot elevation of Finca Helvetia and also in ledgeriana seedlings in seed beds at Acultzingo of Finca Helvetia. Leaves were badly spotted in one seed bed, especially where a tarnished plant bug had been working. The narrow-leaf P.I. trees on their own roots and the Java ledgeriana trees at El Nil of the Helvetia plantation were apparently free from the spotting and made excellent growth. Similar P.I trees at El Naranjo and at El Zapote were badly affected. The trees in the 2 latter locations were weak and in many cases were dying out. The weakened and dying condition may have been due to other causes, with the leaf spot secondary.

On Finca El Zapote the disease was prevalent on grafted trees in Plot No. 5 that had no shade, and also in Plot No. 6 on grafted trees under shade. While the trees under coffee shade appeared to make a better growth, it seemed that the leaf spotting was just as prevalent there. The narrow-leaf clones were most severely affected. Some C. succirubra trees apparently were affected also, but to a lesser degree. The broader-leaf hybrids appeared to have less disease. Apparently some clones or strains show resistance. The P.I. collections growing on their own roots also showed severe leaf spotting; on some weakened plants the disease appeared to be worse, and narrow-leaf strains were most severely affected. On Finca El Zapote, therefore, both the narrow-leaf strains on their own roots and grafted plants apparently were affected in a like manner. In all of these plots plants were approximately 2 years 8 months old.

In earliest stages the spotting is characterized by minute water-soaked spots that appear like bacterial infections. Somewhat older spots are dark red-brown with sunken centers. Still older spots show sunken light-brown centers with dark red-brown borders. The oldest spots have ashen-gray centers with dark red-brown borders. Severely affected young

leaves may show down-turned leaf margins and a general wrinkling. The tips of leaves may be curled. The spotting seems to start at leaf tips and edges, running down the edges, then inward between the lateral veins. Defoliation apparently may take place in severe cases. In other cases apparently normal trees show the leaf spotting without defoliation. The disease was observed on plants both in seed beds and in field plantings.

The writer took material to Washington, D. C. for special study by U.S. Department of Agriculture pathologists. Examination failed to show the presence of a fungus or bacterium in any of the material collected. The general opinion was that it was not of a virus nature.

Because of these studies it was thought that the trouble might be nutritional in origin, but further investigation is absolutely essential to determine this point.

Judging from reports, the disease apparently has been present in Finca El Naranjo and Finca El Zapote for years. It has not caused any widespread damage except in a number of the narrow-leaf ledgeriana strains.

Strains have been selected that appear to show less disease. Certain clones of high-yielding quality that show the trouble should not be discarded until they have been given a further period of years of testing. Since the trouble may be entirely of a nutritional character there is a possibility that these plants may outgrow it with age when planted on different soil.

Further studies, however, are essential to determine exactly what the cause of the trouble may be. These studies should be made along with a careful search for resistance. Each Finca has an excellent collection of clones and species from which to make selections.

Insect Leaf Troubles

Capsid. Injury caused by a plant bug belonging to the family Miridae is characterized by small, circular, parchment-like spots on leaves. If the leaves are attacked when young the thin tissue in the spots falls out, producing a shot-hole effect. Injury may be serious in seed beds or in the nursery. Control can be effected by the use of a rotenone dust.

Plant Bug. Another leaf spot is characterized by distinct, circular, parchment-like spots from 1/8 to 1/2 inch in diameter, light-brown in color, usually with a darker brown edge. This spot was observed on a few Cinchona succirubra and C. ledgeriana hybrids; it seemed to be of no commercial importance. Apparently it also is produced by an insect in the family Miridae.

Scale Insect. A large scale insect determined by Dr. Harold Morrison of the Bureau of Entomology and Plant Quarantine as Saissetia hemisphaerica (Targ.) may attack the leaves and stems and cause weakening of the plants; it also produces a honeydew upon which the sooty-mold fungus (see above) grows.

Thrips. Thrips injury is characterized by a gray or light yellow discoloration of the leaf in spots or blotches. The injury has not been observed in a serious form. As yet the insect has not been identified.

Summary and Conclusions

The writer's studies of Cinchona diseases in Guatemala have shown that the common seed bed and seedling troubles are present and that these trou-

bles are not new. They can be controlled by proper cultural methods. Sanitation, avoidance of crowding, shading, and treatment with fungicides when necessary will control these diseases.

A die-back and stem canker of seedlings is also not new and can be controlled by proper cultural methods and by the use of fungicides, primarily bordeaux mixture.

A stem and crown canker of older trees planted in the field is a more perplexing problem that needs further study. The disease, according to reports, has been considered serious. Apparently, in certain cases it was inititiated by improper grafting. It also appeared that there existed an incompatibility between ledgeriana and succirubra grafts that produced weak plants subject to fungus infection. This incompatibility may not be serious, however, as the use of this combination has been in practice for years in Java and other countries. The stem and crown canker appears to be caused by a parasitic fungus that attacks weakened trees primarily. Further studies are necessary to clarify this trouble.

An apparent root rot is present in certain areas and with certain strains of Cinchona. This trouble should be cleared up with further investigations.

A number of leaf diseases described were of relatively little importance. They were discussed in order to distinguish some of them from what is called the "Unidentified Leaf Spot".

This latter trouble apparently is a problem that bears watching. It has been present in the plantings for years and so far has only been serious on the narrow-leaf strains. It was not observed in field plantings to an extent that appeared dangerous from the standpoint of the industry. It should force the intelligent grower to conduct further studies on nutrition and to select only hardy, high-yielding plants. It is recommended, however, that further studies be made to determine the exact cause and nature of the trouble. These investigations should be made by competent plant pathologists since the problem is of such a nature that it cannot be solved by the planters. At present it cannot be stated whether the trouble is of fungus, bacterial, insect, virus, or nutritional origin. It is absolutely essential for the best interests of Cinchona culture in Central America that the cause and remedy should be established. It would be well to determine how widespread the trouble is in plantings throughout Central America.

Insect injuries apparently are of minor importance.

WASHINGTON, D. C. February 1, 1943

BRIEF NOTES ON PLANT DISEASES

ALFALFA DISEASES IN KANSAS: There has been a considerable increase in downy mildew (Peronospora trifoliorum), especially in first-year stands, and the injury and loss from this disease will be considerable in all new stands. This may be due to the cool rainy weather prevailing the last 6 weeks. In company with C. O. Grandfield, a series of polyhybrid strains of alfalfa being tested at Manhattan by the Division of Forage Crops and Diseases was examined on May 5. Striking differences in resistance to downy mildew attack were apparent. Some strains were so badly mildewed as to be nearly worthless for hay, while other strains were little affect-

ed. From this inspection, it is evident that resistance to downy mildew is inherent in a number of strains and varieties of alfalfa, and the development of desirable highly resistant commercial strains should be possible.

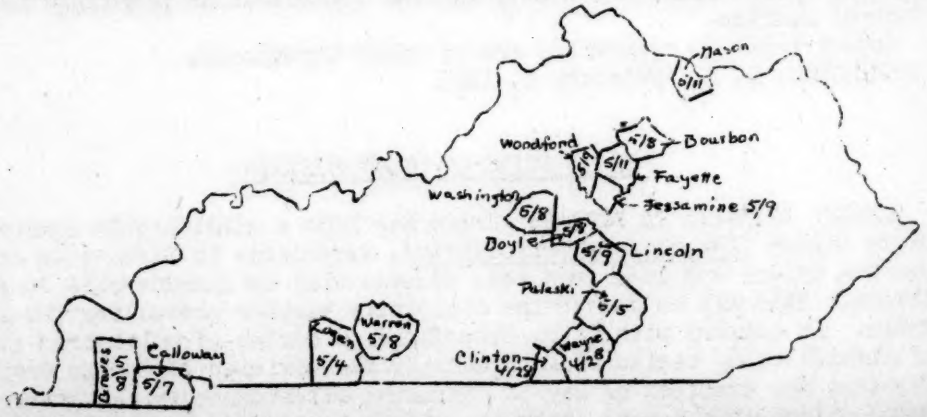
Yellow leaf blotch (Pyrenopeziza medicaginis) is present in varying quantities in all old stands, as is also the common leaf spot (Pseudopeziza medicaginis). Only blotch is causing serious damage as yet, and only in the 3 southeastern counties of Crawford, Cherokee, and Labette. Several fields in Cherokee County were seen where partial defoliation by blotch had already occurred.

Bacterial wilt (Corynebacterium insidiosum) is causing severe losses in stands 4 years old or more. It was seen in all old fields in all parts of the State.--C. M. Slagg, Emergency Plant Disease Prevention Project.

A NEW HOST RECORD FOR MALLOW RUST: The common mallow rust, Puccinia malvacearum Bert., usually regarded as a native of South America, has become cosmopolitan throughout the ranges of its host. Although there are numerous records of this ubiquitous mallow parasite upon Malva neglecta Walls. in Europe, such a host relationship appears to be unrecognized in the United States, undoubtedly because of the fact that M. neglecta has too generally been misidentified as M. rotundifolia. Since C. V. Morton (Rhodora 39: 98-99, 1937) has pointed out the confusion that had previously existed respecting these and related species of Malva in the United States there is naturally some question as to the accuracy of the many records of the rust upon M. rotundifolia.

A recent finding (May 8, 1945) of abundant material of the rust upon M. neglecta at Beverly Mills, Fauquier County, Virginia, by H. A. Allard, establishes this species as a host for it in the United States; the host identity is vouched for by the collector and by E. C. Leonard. The specimen is deposited in the Mycological Collections of the Bureau of Plant Industry, Soils, and Agricultural Engineering, at Beltsville, Maryland.--William W. Diehl, Division of Mycology and Disease Survey

TOBACCO DOWNY MILDEW IN KENTUCKY: Downy mildew (Peronospora tabacina) was first reported April 28 from Wayne County. Since then it has been re-



ported from 15 counties, as shown on the map. Plants range from very

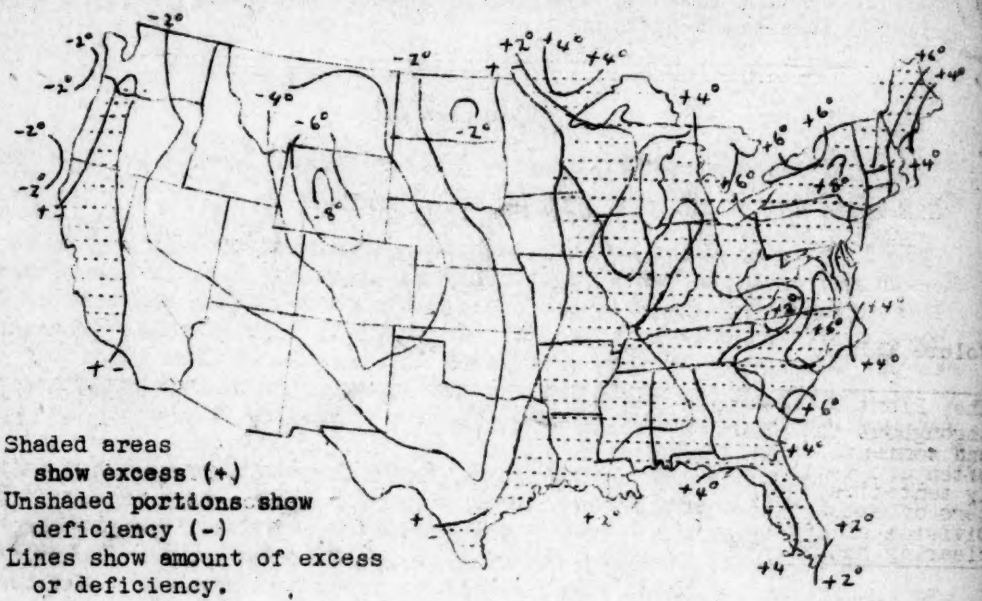
small to setting size all over the State.--W. D. Valleau, Kentucky Agricultural Experiment Station.

APRIL WEATHER

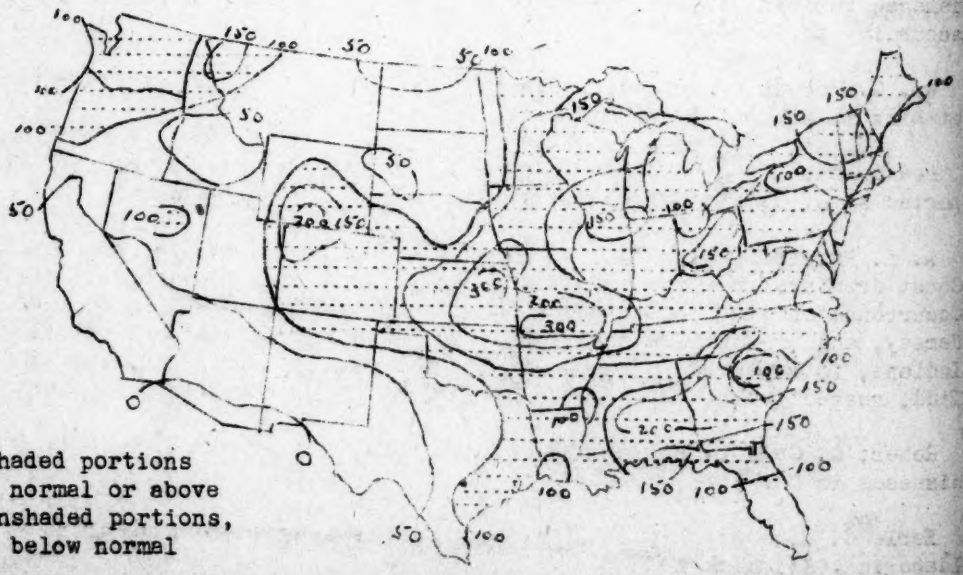
(From U.S. Department of Commerce, Weather Bureau, Weekly Weather and Crop Bulletin for the week ending May 8, 1945)

Map I shows that the country was about evenly divided in regard to warmth and coolness, with practically all sections east of the Mississippi River being somewhat to considerably above normal and west of the river about an equivalent amount below normal. The extreme Northeast was the relatively warmest area, with the plus departures ranging from 6° to as many as 8°, while the coldest area was in the Rocky Mountain section, with the portion through Wyoming averaging from 6° to 8° below normal.

Map II shows that precipitation continued heavy in central and eastern sections of the country where the totals over large areas exceeded one and one-half times the normal. The central Rocky Mountain area also had above-normal precipitation, but most of the West was rather deficient, especially the Southwest where extensive areas had less than half the usual amounts.



Map I. Departure of mean temperature from the normal for April 1945



Map II. Percentage of normal precipitation for April 1945